AMSAT News Service Weekly Bulletins
Issue: ANS-258
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SB ALL @ AMSAT $ANS-258.01
PRELIMINARY KEPS FOR STS-35

HR AMSAT NEWS SERVICE BULLETIN 258.01 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Preliminary Orbital Elements For STS-35/SAREX Mission For Sept. 18 Launch.
The Johnson Space Flight Center (JSC) Amateur Radio Club, W5RRR, has released
the following preliminary Keplerian element set for the Space Shuttle Flight
of STS-35. This element set ASSUMES that the Shuttle Columbia will lift-off
as soon as the launch window opens September 18, 1990 at 05:28:00 UTC.

Satellite: STS-35
Catalog number: TBD
Epoch time: 90261.27986111 (18-SEP-90 06:43:00.000 UTC)
Element set: JSC-003
Inclination: 28.4690 deg Space Shuttle Flight STS-35
RA of node: 270.3379 deg Pre-launch flight profile
Eccentricity: 0.0005720 Keplerian Elements
Arg of perigee: 246.6067 deg Launch: 18-SEP-90 05:28:00 UTC
Mean anomaly: 119.6564 deg
Mean motion: 15.71792660 rev/day W5RRR
Decay rate: 3.10e-04 rev/day^2 NASA Johnson Space Center
Epoch rev: 2

In the NASA "2-line" format the above STS-35 elements are as follows:

STS-35
1 00035U 90261.27986111 .00031000 00000-0 22174-3 0 0030
2 00035 28.4690 270.3379 0005720 246.6067 119.6564 15.71792660 23

All stations wishing to obtain updated STS-35 element sets should monitor the
NASA affiliated radio clubs: WA3NAN, W5RRR, and W6VIO. Also, W1AW will pro-
vide up-to-the-minute information with its CW and phone bulletins on
published frequencies in QST.
/EX
SB ALL @ AMSAT $ANS-258.01
PRELIMINARY STS-35 KEPS

HR AMSAT NEWS SERVICE BULLETIN 258.01 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

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Epoch time: 90261.27986111 (18-SEP-90 06:43:00.000 UTC)
Element set: JSC-003
Inclination: 28.4690 deg Space Shuttle Flight STS-35
RA of node: 250.8207 deg Pre-launch flight profile
Eccentricity: 0.0005720 Keplerian Elements

```
Arg of perigee:   270.3379 deg           Launch: 18-SEP-90   05:28:00 UTC
Mean anomaly:     119.6564 deg
Mean motion:   15.71792660 rev/day                    W5RRR
Decay rate:       3.10e-04 rev/day^2          NASA Johnson Space Center
Epoch rev:               2

In the NASA "2-line" format the above STS-35 elements are as follows:
STS-35
1 00035U          90261.27986111  .00031000  00000-0  22174-3 0  0030
2 00035  28.4690 270.3379 0005720 246.6067 119.6564 15.71792660    23

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NASA affiliated radio clubs: WA3NAN, W5RRR, and W6VIO.  Also, W1AW will pro-
vide up-to-the-minute information with its CW and phone bulletins on
published frequencies in QST.
/EX
SB ALL @ AMSAT $ANS-258.02
SAREX/STS-35 INFO FREQS

HR AMSAT NEWS SERVICE BULLETIN 258.02 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

NASA Affiliated Radio Clubs & W1AW To Provide STS-35/SAREX Mission Updates

Radio amateurs and Short Wave Listeners (SWL) will have many opportunities to
listen to all the onboard activities from the Shuttle Columbia as the
astronauts perform their planned scientific experiments and investigations
with the ASTRO-1 payload.  The following list of frequencies will provide a
"spot" to listen and receive pertinent information on the progress of STS-35
and the Shuttle Amateur Radio Experiment (SAREX).  Live shuttle audio will
only be rebroadcast when the astronauts are awake.  W1AW will provide SAREX
Mission updates during its daily bulletin schedule.

BAND  WA3NAN    W5RRR     W6VIO*        W1AW VOICE  K6MF***  WA4NZD
       GSFC      JSC       JPL          BULLETINS**           MSFC

75    3.860     3.850      N/A           3.990      3.840    3.855
40    7.185     7.227      N/A           7.290      7.165    7.232
20   14.295    14.280    14.270         14.290       N/A    14.267
15   21.395    21.350    21.340         21.390       N/A    21.362
10   28.650    28.495      N/A          28.590       N/A    28.395
 2  147.450   146.640   145.460           N/A      145.580    N/A
1.3    N/A       N/A  224.040, 224.080    N/A        N/A      N/A

*W6VIO will provide live shuttle audio coverage to the South Pacific and
Japan by pointing its HF beams in that direction.

**W1AW Voice Bulletins are transmitted daily at 01:30 UTC and 04:30 UTC.
  W1AW will also provide rebroadcast of shuttle audio on Voice Bulletin
  frequencies when WA4SIR is communicating with school children. These
  "live" sessions with school children are scheduled throughout the STS-35
  mission.

***K6MF will provide live shuttle audio coverage for the San Francisco Bay
   Area.
/EX
SB ALL @ AMSAT $ANS-258.03
SAREX OPERATION PROCEDURE 1

HR AMSAT NEWS SERVICE BULLETIN 258.03 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT
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Understanding the Basics Will Make SAREX a Success (Part 1)

The Shuttle Amateur Radio EXperiment, also known as SAREX, has sparked interest in space communication in a large number of amateur stations around the world.

For a good number of stations, this may be their first attempt at talking to other than "earth-bound" stations. By understanding the basics of when it is possible to communicate with Ron Parise, WA4SIR, it will make it a more successful experience for all involved.

First it must be understood that the orbiter Columbia is in low earth orbit. It will be at an altitude of about 150 miles traveling at about 17,500 mph. Being in low earth orbit it will move across the sky very quickly and is not like a geostationary satellite which appears to be fixed at one location in the sky at all times. This means that at best, you will have no more than about 10 minutes maximum during which Columbia will be visible from your QTH during any particular orbit.

Because all communications with SAREX will be done in the 2 Meter band, once Columbia "drops" below the horizon, it will not be possible to communicate with Ron or the packet ROBOT on-board the Orbiter (propagation at 145 MHz does not bend with the ionosphere like it does on HF). Attempting to call Ron when Columbia is not visible from your QTH is pointless and can in fact be disruptive to other amateur communications. Your transmitting frequency of 144.95 MHz is also used in some areas by amateur packet systems. To minimize the disruption to other stations, it is necessary to derive a schedule of when Columbia will be above the horizon and to verify that transmissions from Columbia are in progress on 145.55 before attempting to transmit. Part II of this bulletin will provide some examples of this schedule, and give you information on how to derive one for your QTH.
/EX
SB ALL @ AMSAT $ANS-258.04
SAREX OPERATION PROCEDURE 2

HR AMSAT NEWS SERVICE BULLETIN 258.04 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Understanding the Basics Will Make SAREX a Success (Part 2)

Using any of the popular satellite tracking programs, loaded with the Keplerian elements for Columbia's orbit, you will be able to print out a listing of times when Columbia will be visible from you QTH. If you do not have access to one of these programs yourself, contact AMSAT Headquarters at (301) 589-6062 and you will be given the name and phone number of an AMSAT volunteer near you. They will be very happy to work out the schedule for you.

Below are listed the UTC date and AOS/LOS times (Acquisition of Signal/Loss of Signal) for Atlanta, Dallas, and Los Angeles. These schedules are based on a Sept 18, 5:28 GMT launch of Columbia. You will note that most of the passes last no longer than 10 minutes and they are late at night.

QTH	DATE	AOS	LOS	ORBIT #
ATLANTA	20SEP90	0306	0315	31
"	20SEP90	0442	0452	32
"	20SEP90	0619	0628	33
"	20SEP90	0757	0803	34
DALLAS	20SEP90	0303	0311	31
"	20SEP90	0439	0448	32
"	20SEP90	0615	0625	33

```
    "         20SEP90        0752      0801           34

LOS ANGELES   20SEP90        0435      0443           32
    "         20SEP90        0610      0620           33
    "         20SEP90        0747      0756           34
    "         20SEP90        0924      0932           35
```

Based on your location, you should only transmit to SAREX when it is above the horizon and should not leave your equipment unattended attempting to connect automatically. This is very unlikely to meet with success but is certain to generate unnecessary QRM. You should listen first on 145.55 to determine if you can hear WA4SIR. Only when you can hear his transmissions should you consider calling him or trying to connect to the packet ROBOT. Do not transmit on the 145.55 downlink frequency. WA4SIR will not be listening there.

This mission has the potential to provide Amateur Radio with some Prime Time "PR". Many non-hams as well as the news media will be watching our "performance". A negative experience during this mission could very easily jeopardize any future SAREX missions. By properly preparing prior to attempting a QSO with SAREX, not only will you give yourself a better chance to actually succeed at talking with Ron, but it will show the world at large how exciting Amateur Radio can be. Good Luck!!
/EX
SB ALL @ AMSAT $ANS-258.05
SAREX FREQUENCIES

HR AMSAT NEWS SERVICE BULLETIN 258.05 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Downlink/Uplink Frequencies for Voice QSOs to be used on Upcoming Mission

Just in case you missed it (perhaps you have been on vacation for the past 4 months) here are the SAREX frequencies:

	Shuttle TX Freq	Shuttle RX Freq	
North/South American Frequencies	145.55 MHz	144.95 MHz	*** Primary ***
	"	144.91 MHz	
	"	144.97 MHz	
Remainder of the World Frequencies	145.55 MHz	144.95 MHz	*** Primary ***
	"	144.70 MHz	
	"	144.75 MHz	
	"	144.80 MHz	
	"	144.85 MHz	

These are the frequencies Ron Parise (WA4SIR) will use on both voice and packet. Please note that the frequencies Ron will be listening for stations ARE DIFFERENT than the one he will transmit on. This is a very important fact to understand. Ron will transmit to earth (downlink) on a single frequency: 145.55 MHz. He will listen for stations transmitting to him (uplink) on the other frequencies listed. This "split" operation is used quite successfully by DXers when operating in an environment where large pile ups are expected.

The first pair of frequencies (noted as primary) is a standard -600 KHz split used by repeaters. This was done so that communicating with SAREX could be accomplished by Hams using standard FM transceivers. If Ron finds that the receive QRM becomes unmanageable, he may listen on the alternate frequencies listed. In North America, the lower section of the FM repeater bandplan extends as high as 144.90 and thus why the uplink frequencies only extend

down to 144.91 MHz.

THIS IS IMPORTANT! There will be no simplex operation with SAREX on either voice or packet. Although packeteers are not used to operation with a TX/RX offset, in this case, it is the only way to connect to SAREX. If you transmit on 145.55 MHz the only people who will hear you are those other Hams in your area trying to contact SAREX (You will most likely become an instant celebrity, but not necessarily in the positive sense of the word!).

There should be about 3 KHz of Doppler shift due to the orbital velocity of the Columbia spacecraft (it will be about 3 KHz high near the beginning of a pass and about 3 KHz low near the end). By limiting the deviation of your transmitter to 3 KHz, Ron's receiver should have little trouble capturing your signal.
/EX
SB ALL @ AMSAT $ANS-258.06
TRACKING SOFTWARE PIRATED

HR AMSAT NEWS SERVICE BULLETIN 258.06 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Pirated Versions of AMSAT Software are Appearing on BBSs

A number of BBS sysops have called into AMSAT Headquarters inquiring as to whether Instant Track was now being offered as shareware or is in the public domain. It seems that there are people who are uploading the software into BBSs from which anyone who dials in can download a "free" copy. In many cases the copyright information is still intact when running the program.

NONE of the tracking software which AMSAT offers is in fact shareware or in the public domain. The distribution of software is one of the major contributors to the funding of the construction, launch and operation of AMSAT's satellites.

These pirated versions of the software represent a serious threat to future spacecraft development. If any of you see any software which is being distributed by BBSs that does not look like freeware, please inform the SYSOP immediately. With many thousands of files on most BBS systems, it is not unusual for SYSOPS not to look at all of them.
/EX
SB ALL @ AMSAT $ANS-258.07
DRIG WX SATELLITE UPDATE

HR AMSAT NEWS SERVICE BULLETIN 258.07 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

DRIG Provides WX Satellite Frequency Summary

Jeff Wallach (N5ITU), Chairman of the Dallas Remote Imaging Group (DRIG) wants to remind OSCAR satellite users they can easily process weather satellite Automatic Picture Transmissions (APT) using a large part of their current station. If you have a 2m beam or a turnstile with a pre-amp, if you have satellite tracking software and a general coverage receiver which can tune to a 137 MHz, you are not far from being able to process WX pictures. Ideally the 137 MHz receiver you use should be capable of wideband FM modulation with a 50 KHz wide IF, but N5ITU had experimented with FM scanners which have 150 KHz IF with good success! Jeff points out that there are several interface cards which can easily be installed into IBM PC computers and clones which will turn the APT signals into very detailed pictures (4 km of resolution). Once you have the weather image signal and its audio is routed to the interface card in the back of your PC, with the proper software, the pictures are easily produced on a EGA or VGA screen. For

further information about what it takes to process APT pictures, please read
Bulletin #17 on the AMSAT/DRIG BBS at (214) 394-7438.

Weather Satellite Frequency Summary

WX SAT	CAT #	Frequency	Status
NOAA 09	15427	137.620	Active-Afternoon
NOAA 10	16969	137.500	Active-Morning
NOAA 11	19531	137.620	Active-Afternoon
Meteor 2-16	18312	137.850	Currently Commanded Off
Meteor 2-17	18820	137.300	Active
Meteor 2-18	19851	137.300	Currently Commanded Off
Meteor 3-2	19336	137.300	Currently Commanded Off
Meteor 3-3	20305	137.850	Active
Meteor 2-19	20510	137.850	Currently Commanded Off
Feng Yun 1B	20788	137.795	Active

/EX
SB ALL @ AMSAT $ANS-258.08
OPERATIONS NET SCHEDULE

HR AMSAT NEWS SERVICE BULLETIN 258.08 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

AMSAT-NA Operations Net Schedule Announced

AMSAT Operations Nets are planned for the following times. Mode B nets are conducted on an AO-13 downlink frequency of 145.950. Mode J/L nets are conducted on an AO-13 downlink frequency of 435.970.

Date	Phs	mode	UTC	NCS	Backup	U.S. day
28 Sep 90	171	J/L	0100	KA5SMA	N5BF	Thursday
9 Oct 90	172	J/L	0015	WD0E	WB9ANQ	Monday

An AO-13 re-orientation is scheduled for 15 October 90. The new Operations Net schedule will be distributed starting next week.

For information on the amateur satellite program and how you can participate, contact AMSAT-NA at P.O. Box 27, Washington, DC 20044, phone (301) 589-6062, or contact your local AMSAT Area Coordinator.
/EX
SB ALL @ AMSAT $ANS-258.09
AO-13 / AO-10 TRNSPNDR SKED

HR AMSAT NEWS SERVICE BULLETIN 258.09 FROM AMSAT HQ
SILVER SPRING, MD SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

A new Transponder Schedule for AO-13 was put into effect on September 8 which is planned to continue through October 17.

Mode S operation has been eliminated for the time being since relatively poor solar panel illumination does not allow sufficient power for proper battery maintenance during Mode S and S/B periods. Satellite reorientation (a.k.a. magnetorquing) is scheduled to commence on October 15 and once it has been completed, it is expected that Mode S will be returned to service.

The present transponder schedule for AO-13 is as follows:

```
Mode-B          : MA 003 to MA 165
Mode-JL         : MA 165 to MA 195
Mode-B          : MA 195 to MA 240
Off             : MA 240 to MA 003 (Mode B Beacon On)
Omni Antennas   : MA 240 to MA 060

The September 10 attitude estimate is:

BLON = 205  and  BLAT = -7


AMSAT-OSCAR-10 appears NOT TO have been receiving sufficient solar panel
illumination to support Mode-B transponder operations.  Both beacon and
transponder signals started showing signs of FMing.  Therefore, until further
notice please DO NOT use AO-10's transponder.
It is expected that AO-10 may once again receive sufficient solar
illumination to support Mode-B transponder operation by sometime in November.
/EX
SB ALL @ AMSAT $ORBS-258.O
Orbital Elements 258.OSCAR

HR AMSAT ORBITAL ELEMENTS FOR OSCAR SATELLITES
FROM N3FKV HEWITT, TX  SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Satellite: AO-10
Catalog number: 14129
Epoch time:      90238.61357863
Element set:     547
Inclination:       26.0406 deg
RA of node:       187.8479 deg
Eccentricity:    0.5952609
Arg of perigee:   170.7338 deg
Mean anomaly:     209.0516 deg
Mean motion:    2.05880945 rev/day
Decay rate:      -1.40e-07 rev/day^2
Epoch rev:            5418

Satellite: UO-11
Catalog number: 14781
Epoch time:      90248.58465124
Element set:     776
Inclination:       97.9445 deg
RA of node:       298.4935 deg
Eccentricity:    0.0012840
Arg of perigee:   357.8666 deg
Mean anomaly:       2.2471 deg
Mean motion:   14.65634608 rev/day
Decay rate:      1.795e-05 rev/day^2
Epoch rev:           34774

Satellite: RS-10/11
Catalog number: 18129
Epoch time:      90248.01674093
Element set:     310
Inclination:       82.9217 deg
RA of node:       269.5464 deg
Eccentricity:    0.0010380
Arg of perigee:   255.9239 deg
Mean anomaly:     104.0775 deg
Mean motion:   13.72106928 rev/day
Decay rate:       2.12e-06 rev/day^2
Epoch rev:           16039
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Satellite: AO-13
Catalog number: 19216
Epoch time:      90233.10507939
Element set:     144
Inclination:       56.9230 deg
RA of node:       139.8507 deg
Eccentricity:    0.7012370
Arg of perigee:   234.0055 deg
Mean anomaly:      39.5251 deg
Mean motion:    2.09695679 rev/day
Decay rate:       1.46e-06 rev/day^2
Epoch rev:            1676

Satellite: FO-20
Catalog number: 20480
Epoch time:      90237.47999198
Element set:     102
Inclination:       99.0343 deg
RA of node:       270.8937 deg
Eccentricity:    0.0540177
Arg of perigee:   251.6210 deg
Mean anomaly:     102.5464 deg
Mean motion:   12.83159072 rev/day
Decay rate:       1.10e-07 rev/day^2
Epoch rev:            2563
/EX
SB ALL @ AMSAT $ORBS-258.D
Orbital Elements 258.MICROS

HR AMSAT ORBITAL ELEMENTS FOR THE MICROSATS
FROM N3FKV HEWITT, TX  SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Satellite: UO-14
Catalog number: 20437
Epoch time:      90247.73613164
Element set:     203
Inclination:       98.6920 deg
RA of node:       323.5953 deg
Eccentricity:    0.0010783
Arg of perigee:   285.7121 deg
Mean anomaly:      74.2846 deg
Mean motion:   14.28702551 rev/day
Decay rate:       6.25e-06 rev/day^2
Epoch rev:            3222

Satellite: AO-16
Catalog number: 20439
Epoch time:      90244.42881742
Element set:     105
Inclination:       98.6999 deg
RA of node:       320.4480 deg
Eccentricity:    0.0010735
Arg of perigee:   295.6429 deg
Mean anomaly:      64.3635 deg
Mean motion:   14.28801476 rev/day
Decay rate:       6.24e-06 rev/day^2
Epoch rev:            3175

Satellite: DO-17
Catalog number: 20440
Epoch time:      90244.42236293
Element set:     114
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Inclination:       98.7005 deg
RA of node:       320.4573 deg
Eccentricity:    0.0011018
Arg of perigee:   296.3190 deg
Mean anomaly:      63.6848 deg
Mean motion:   14.28851493 rev/day
Decay rate:       6.66e-06 rev/day^2
Epoch rev:            3175

Satellite: WO-18
Catalog number: 20441
Epoch time:      90244.68652978
Element set:     108
Inclination:       98.7001 deg
RA of node:       320.7491 deg
Eccentricity:    0.0011535
Arg of perigee:   295.1838 deg
Mean anomaly:      64.8146 deg
Mean motion:   14.28943119 rev/day
Decay rate:       6.12e-06 rev/day^2
Epoch rev:            3179

Satellite: LO-19
Catalog number: 20442
Epoch time:      90243.62556929
Element set:     110
Inclination:       98.7011 deg
RA of node:       319.7147 deg
Eccentricity:    0.0011883
Arg of perigee:   298.9505 deg
Mean anomaly:      61.0485 deg
Mean motion:   14.29011597 rev/day
Decay rate:       6.00e-06 rev/day^2
Epoch rev:            3164
/EX
SB ALL @ AMSAT $ORBS-258.M
Orbital Elements 258.MISC

HR AMSAT ORBITAL ELEMENTS FOR MANNED AND MISCELLANEOUS SATELLITES
FROM N3FKV HEWITT, TX  SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Satellite: SALYUT 7
Catalog number: 13138
Epoch time:      90248.72318842
Element set:     484
Inclination:       51.5986 deg
RA of node:       254.5411 deg
Eccentricity:    0.0001817
Arg of perigee:    67.0187 deg
Mean anomaly:     293.0979 deg
Mean motion:   15.70856366 rev/day
Decay rate:     4.8706e-04 rev/day^2
Epoch rev:           47748

Satellite: MIR
Catalog number: 16609
Epoch time:      90248.72344750
Element set:     910
Inclination:       51.6125 deg
RA of node:       283.8097 deg
Eccentricity:    0.0023995
Arg of perigee:   342.2417 deg
Mean anomaly:      17.7736 deg
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Mean motion:   15.61017685 rev/day
Decay rate:     2.1031e-04 rev/day^2
Epoch rev:           26069

Satellite: HUBBLE
Catalog number: 20580
Epoch time:      90248.90482313
Element set:     200
Inclination:       28.4707 deg
RA of node:        95.9330 deg
Eccentricity:    0.0006149
Arg of perigee:   243.4134 deg
Mean anomaly:     116.5621 deg
Mean motion:   14.84834012 rev/day
Decay rate:    -8.0583e-04 rev/day^2
Epoch rev:            1998

Satellite: BADR-1
Catalog number: 20685
Epoch time:      90248.53120415
Element set:      63
Inclination:       28.4982 deg
RA of node:       326.3886 deg
Eccentricity:    0.0467875
Arg of perigee:   317.3975 deg
Mean anomaly:      39.1627 deg
Mean motion:   15.14230368 rev/day
Decay rate:     2.2783e-03 rev/day^2
Epoch rev:             775
/EX
SB ALL @ AMSAT $ORBS-258.W
Orbital Elements 258.WEATHER

HR AMSAT ORBITAL ELEMENTS FOR WEATHER SATELLITES
FROM N3FKV HEWITT, TX  SEPTEMBER 15, 1990
TO ALL RADIO AMATEURS BT

Satellite: NOAA-9
Catalog number: 15427
Epoch time:      90247.24002597
Element set:     621
Inclination:       99.1723 deg
RA of node:       248.9243 deg
Eccentricity:    0.0015720
Arg of perigee:   144.1460 deg
Mean anomaly:     216.0760 deg
Mean motion:   14.12656946 rev/day
Decay rate:       5.30e-06 rev/day^2
Epoch rev:           29514

Satellite: NOAA-10
Catalog number: 16969
Epoch time:      90243.40601972
Element set:     463
Inclination:       98.5965 deg
RA of node:       269.6586 deg
Eccentricity:    0.0014614
Arg of perigee:    53.4264 deg
Mean anomaly:     306.8260 deg
Mean motion:   14.23709955 rev/day
Decay rate:       6.83e-06 rev/day^2
Epoch rev:           20531

Satellite: MET-2/17
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Catalog number: 18820
Epoch time:      90243.87015611
Element set:     353
Inclination:       82.5444 deg
RA of node:       290.2998 deg
Eccentricity:    0.0018108
Arg of perigee:   110.0006 deg
Mean anomaly:     250.3106 deg
Mean motion:   13.84368061 rev/day
Decay rate:       2.34e-06 rev/day^2
Epoch rev:           13065

Satellite: MET-3/2
Catalog number: 19336
Epoch time:      90246.44585206
Element set:     571
Inclination:       82.5433 deg
RA of node:       222.0444 deg
Eccentricity:    0.0019030
Arg of perigee:   116.6918 deg
Mean anomaly:     243.6133 deg
Mean motion:   13.16903609 rev/day
Decay rate:       3.92e-06 rev/day^2
Epoch rev:           10125

Satellite: NOAA-11
Catalog number: 19531
Epoch time:      90248.25933199
Element set:     345
Inclination:       98.9878 deg
RA of node:       196.6780 deg
Eccentricity:    0.0013072
Arg of perigee:    61.2501 deg
Mean anomaly:     298.9986 deg
Mean motion:   14.11698208 rev/day
Decay rate:       7.43e-06 rev/day^2
Epoch rev:           10026

Satellite: MET-2/18
Catalog number: 19851
Epoch time:      90249.06698872
Element set:     306
Inclination:       82.5297 deg
RA of node:       164.0311 deg
Eccentricity:    0.0014997
Arg of perigee:   132.0536 deg
Mean anomaly:     228.2043 deg
Mean motion:   13.83997909 rev/day
Decay rate:      -1.22e-06 rev/day^2
Epoch rev:            7675

Satellite: MET-3/3
Catalog number: 20305
Epoch time:      90246.83938007
Element set:     210
Inclination:       82.5564 deg
RA of node:       162.5367 deg
Eccentricity:    0.0017436
Arg of perigee:   128.9419 deg
Mean anomaly:     231.3248 deg
Mean motion:   13.15862065 rev/day
Decay rate:      -4.30e-07 rev/day^2
Epoch rev:            4129
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Satellite: MET-2/19
Catalog number: 20670
Epoch time:      90243.41969962
Element set:      49
Inclination:       82.5422 deg
RA of node:       228.9395 deg
Eccentricity:    0.0017832
Arg of perigee:    77.0314 deg
Mean anomaly:     283.2836 deg
Mean motion:   13.83846103 rev/day
Decay rate:       1.09e-06 rev/day^2
Epoch rev:             892

Satellite: FENGYUN 1B
Catalog number: 20789
Epoch time:      90248.01320595
Element set:       6
Inclination:       98.9372 deg
RA of node:       282.6737 deg
Eccentricity:    0.0010104
Arg of perigee:   260.1569 deg
Mean anomaly:      99.6821 deg
Mean motion:   14.00449633 rev/day
Decay rate:    -2.5413e-04 rev/day^2
Epoch rev:              27
/EX
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